May 24, 2013

NMFS Guidance on Conducting Status Reviews under the Endangered Species Act

Introduction

The goal of this guidance is to establish a standardized approach to conducting status reviews (in response to a petition or self-initiated) under section 4 of the Endangered Species Act (ESA). This guidance is intended to foster more transparent, well documented, objective, and scientifically and legally defensible determinations.

Figure 1 outlines the steps for conducting a status review. Each of these steps is discussed in detail. Appendices are also included to provide: definitions of ESA terms and terminology (highlighted in bold throughout this document) that are not otherwise discussed thoroughly within the text (**Appendix A**); guidance on extinction risk evaluations (**Appendix B**); a discussion of the use of structured decision making and some examples (**Appendix C**); and a template for a Terms of Reference (TOR)[1] document (**Appendix D)**.

Also, ESA policies referenced within this document are available at: http://www.nmfs.noaa.gov/pr/laws/esa/policies.htm.

Conducting a Status Review

Once the region or the NMFS Office of Protected Resources (F/PR) determines that the petition has presented substantial scientific or commercial information indicating that a petitioned listing action may be warranted, it initiates a status review of the species to determine whether the species is threatened or endangered under the ESA. An ESA status review can also be initiated by NMFS, without a petition. The best available scientific and commercial information is compiled and analyzed and then documented in a Status Review Report. In some cases it may be appropriate to prepare several reports that focus on different aspects of a status review. In other, usually simpler, cases, it may not be necessary to develop a separate, stand-alone document from the 12-month finding. Whatever approach is taken, all of the information must be tied together in the 12-month finding (e.g., if certain data have already been compiled and analyzed by a credible entity, the region or F/PR does not need to repeat this work). For the remainder of this guidance, however, we will refer to a Status Review Report, with the understanding that there are other ways to gather and analyze the best available information when conducting a status review.

When a Team is established, Team members are expected to: attend meetings regularly; gather and assess species information; investigate historical and current rates of decline; identify threats to the species; estimate extinction risk to the species; and contribute to appropriate portions of the status review report in a timely manner.

[1] A Terms of Reference is a document that outlines the responsibilities of the Team or contractor for conducting an ESA status review of a species and preparing a Status Review Report. A template of a TOR is provided in Appendix D.

All staff participating in a status review must adhere to the NOAA Scientific Integrity Policy (NAO 202-735D) and otherwise maintain an objective approach to the process (http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_202/202-735-D.pdf).

The general steps to conducting a status review of a species are described below (See **Figure 1**), but see the text for details not included in Figure 1.

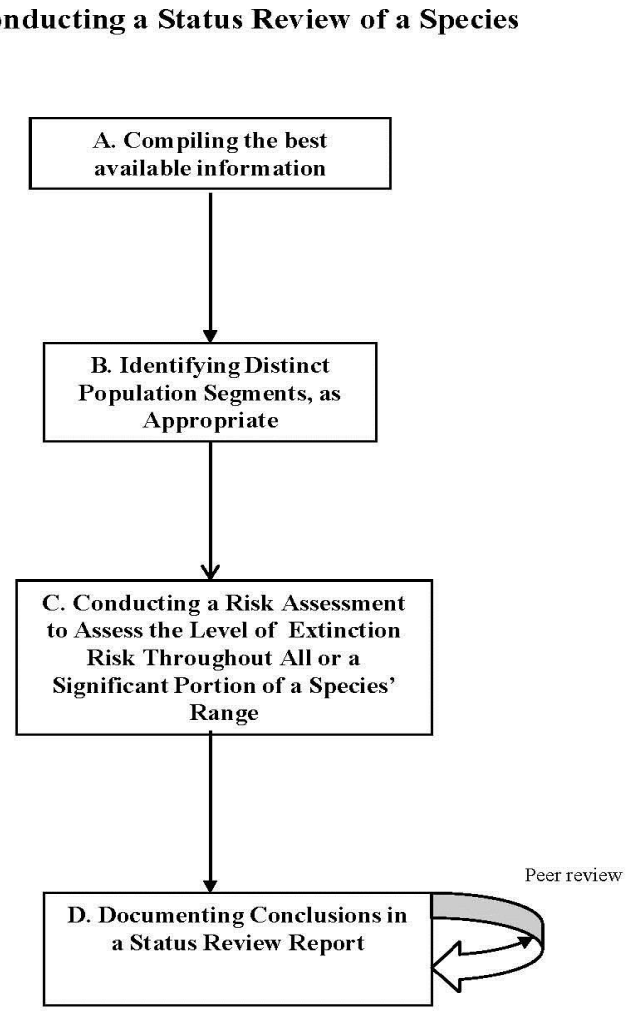

Figure 1. General procedure for conducting a status review of a species. Roman numeral and letters (II.A. – D.) correspond to the steps described in the text.

A. Compiling the Best Available Information

To compile the best available scientific and commercial[2] data, the biologist (or Team) will search the relevant literature for information on the species, its habitat, and threats to its existence. Information will also be solicited from experts in the species' biology and/or individuals with expertise in particular risk factors which may be threatening a species. Scientific and commercial data will also be solicited from states, other federal agencies, foreign governments, tribes, academia, individuals, nonprofit organizations, industry groups, etc., through, at a minimum, the *Federal Register* notice of the 90-day finding.

The compiled data, which also includes any information received in response to a positive 90-day finding, should reflect the life history and ecology of the species, and will likely include information on historical and current abundance, trends, population growth rate, distribution, population connectivity, genetic diversity, and threats facing the species. Typically, no new empirical studies would be conducted during a status review because the ESA requires the use of the best *available* scientific and commercial information (emphasis added) and it contains strict deadlines for completing status reviews.

While the biologist or Team gathers information on the species' status, the region(s) will gather information on protective efforts for the agency's evaluation. When specifically included in the TOR for the Status Review Report, information about protective efforts can also be collected by the biologist (or Team). This information will be used by the Region or F/PR later in developing a recommended listing determination.

[2] "Commercial" information means information such as fisheries logbook data, trade statistics; in other words, information that sheds light on the biological status of a species. This does not include information on the economic impacts of listing a species as threatened or endangered.

B. Identifying Distinct Population Segments, as Appropriate

To be considered for listing under the ESA, a group of organisms must constitute a "species," which is defined in section 3 of the ESA to include "any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate fish or wildlife which interbreeds when mature." NMFS and USFWS jointly published a policy regarding the recognition of DPSs of vertebrate species under the Endangered Species Act (DPS Policy, 61 FR 4722; February 7, 1996). Prior to that, NMFS published a policy (ESU Policy, 56 FR 58612; November 20, 1991) describing the agency's application of the ESA definition of "species" to anadromous Pacific salmon population segments, which are referred to in the policy as "evolutionarily significant units" (ESUs). NMFS has applied the 1991 ESU policy in identifying West Coast salmon species (*Oncorhynchus* spp., including sockeye, Chinook, coho, chum, and pink salmon). In identifying species of West Coast steelhead (*Oncorhynchus mykiss*), for which NMFS shares jurisdiction with USFWS, NMFS applies the joint DPS policy.

"DPS" is not a scientifically defined term; it is a term of art that is used in the context of ESA law and policy. Furthermore, when passing the provisions of the ESA that give us authority to list DPSs, Congress indicated that this provision should be used sparingly. We have discretion with regard to listing DPSs and, in order to be consistent with the Congressional report that followed the introduction of the DPS language in the ESA to identify DPSs sparingly, we will generally not, on our own accord, evaluate listings below the taxonomic species or subspecies level if the best available information indicates that the species or subspecies is in danger of extinction throughout all or a significant portion of its range. In cases where we have discretion over whether to list a species as DPSs, we should only do so if there is an overriding conservation benefit to the species. The following questions can help determine whether such conservation benefits exist.[3]

a) Are some populations of a species or subspecies more at risk, or not at risk?
b) Can we better preserve genetic integrity by listing as DPSs?
c) Would ESA protections be expedited by focusing on one or more DPSs instead of the entire species' range?
d) Will processing multiple actions associated with multiple DPSs take away from protection of this or other species?
e) If dividing an already-listed species with critical habitat in place into DPSs, will the circumstances allow the agency to take steps to avoid a gap in protection for habitat for the DPSs?
f) Will mixing of individuals among DPSs make it difficult to quantify and monitor take if we list separate DPSs instead of one taxonomic species or subspecies?
g) Will the need to redo any section 4(d) regulations for newly listed DPSs of a species previously listed rangewide result in lapses in protections (i.e., can a new section 4(d) regulation be published simultaneously with the new DPS listing(s)?
h) Are some animals within a specific geographic range (population) facing unique threats?
i) Is a population experiencing unusual mortality or is abundance trend different?

[3] Note that these questions do not include biological factors for meeting the DPS criteria of the Policy Regarding the Recognition of Distinct Vertebrate Population Segments (61 FR 4722; February 7, 1996 - DPS Policy), used by Teams in determining whether any population segments qualify as DPSs.

j) Would recovery be expedited by focusing on DPSs instead of entire species' range or vice versa?
k) Would delisting a DPS of a listed species negatively impact the recovery of the rest of the species (presumably made up of several additional DPSs)?

The best available information must be used in determining that a population meets the DPS Policy criteria. At the same time, the DPS Policy allows for flexibility in identifying DPSs. DPSs need not be identified at the lowest level of distinction possible, especially if this will not provide a conservation benefit to the species.

C. Conducting a Risk Assessment to Assess the Level of Extinction Risk Throughout All or a Significant Portion of a Species' Range

The ESA contains key terms in the definitions of "endangered species" and "threatened species" that need to be defined in order to determine whether to list a species as threatened or endangered: "**foreseeable future**" and "**significant portion of its range**." More detailed background on these terms is available in **Appendix A**, but the biologist (or Team) can rely on the following interpretations of these terms:

Foreseeable future: For the purpose of this guidance, it is appropriate to interpret "foreseeable future" as the timeframe over which predictions about the future in making determinations about the future conservation status of the species can be reasonably relied upon (M-37021 2009 DOI memorandum). Those predictions can be in the form of extrapolation or population or threat trends, analysis of how threats will affect the status of the species, or assessment of future events that will have a significant new impact on the species. The biologist (or Team) should consider the life history of the species, habitat characteristics, availability of data, kinds of threats, ability to predict threats, and the reliability of models used to forecast threats over that "foreseeable future" in determining the time period that constitutes the foreseeable future. This approach does not limit the time frame under consideration to the length of time into the future for which a species' status can be quantitatively modeled or predicted within predetermined limits of statistical confidence, but uncertainties of any modeling efforts should be documented. A single, defined "foreseeable future" or several "foreseeable futures" for different relevant threats should be defined early in the status review process, in consultation with the region and/or F/PR, so that the region and/or F/PR can provide policy considerations, and the rationale for the identification of a particular "foreseeable future" should be documented in the Status Review Report.

Significant portion of its range: A portion of the range of a species will be considered "significant" if its contribution to the viability of the species is so important that, without that portion, the species would be in danger of extinction (Draft Policy on Interpretation of the Phrase "Significant Portion of its Range" in the Endangered Species Act's Definitions of "Endangered Species" and "Threatened Species," 76 FR 76987; December 9, 2011 [Draft SPOIR Policy]). The biologist (or Team) should not determine whether a portion of a range is significant, but should identify any portions of the range of a species that contribute substantially to the viability of the species and evaluate the probability of extirpation in those portions, quantitatively or qualitatively. The region or F/PR will use this information to make the determination on whether these portions are significant, which involves policy considerations.

1) Extinction Risk Assessment

Once the best available information has been compiled, the biologist (or Team) will proceed with the risk assessment (i.e., the evaluation of demographic risks, threats, and extinction risk facing the species, subspecies, or any identified DPSs of a vertebrate population). To do this, the biologist (or Team) should consider the key principles of conservation biology that influence the persistence of the species (Wainwright and Kope, 1999; McElhany *et al*., 2000; Shaffer and Stein, 2000). McElhany *et al*. (2000) describe an approach to evaluating the viability of salmonid populations and include useful guidance on how to consider abundance, spatial distribution, productivity, and diversity at the population level, and the effect of catastrophes and long-term demographic and evolutionary processes at the Evolutionarily Significant Unit (ESU) level. NMFS has used this approach in numerous status reviews (e.g., see status review reports and *Federal Register* notices for Pacific salmonids, killer whale, green sturgeon, eulachon, and corals, available at www.nmfs.noaa/pr/ species/esa/). Another similar approach used by NMFS for the smalltooth sawfish status review is described in Wainwright and Kope (1999). The USFWS approach of evaluating a species' status in terms of its redundancy, resiliency, and representation (Shaffer and Stein, 2000) relies on the same conservation biology principles, though they are expressed differently (for a comparison of the these conservation biology principles, see p. 76994 of Draft Policy on Interpretation of the Phrase "Significant Portion of its Range" in the Endangered Species Act's Definitions of "Endangered Species" and "Threatened Species," 76 FR 76987; December 9, 2011). The extinction risk analysis performed by the Team (or biologist) should not include the terms "Endangered" or "Threatened" or their ESA definitions.

The Viable Salmonid Population (VSP) approach should begin with an evaluation of the quality and extent of the available data on the species' abundance, spatial distribution, productivity, and diversity. The biologist (or Team) should work through these four VSP criteria and explain how each is considered, what information is available for each, and what the conclusions are regarding risk associated with that criterion. This structured way of stepping through the elements that compose demographic risk will foster some uniformity and consistency in the approach to status reviews and facilitate comparisons across species and regions. The approach should emphasize the consideration of the specific demographic risks faced by a species, both short-term and long-term, and also consider the impact of natural and anthropogenic disturbances (i.e., catastrophic events) (Bisson *et al*., 1997) and evolutionary potential (McElhany *et al*., 2000). All available information regarding these factors and any qualitative evaluations of these factors should be synthesized to develop an estimated risk of extinction. Ultimately, the desired result of this analysis is an estimate of the risk of extinction through the foreseeable future. If possible, extinction risk should be estimated as x% chance of extinction within the foreseeable future (i.e. within y years). If data are not available for such estimates, then the biologist (or Team) can estimate extinction risk in ranges of extinction risk (e.g., 0-25%, 25-50%, 51-75%, and 75-100%) within the foreseeable future. The biologist (or Team) should avoid presenting results in exactly three risk categories because of the likelihood of readers assuming that these equate to Threatened, Endangered, and Not Warranted determinations. The Status Review Report is not the place to make recommendations on whether to list a species under the ESA;

rather, the purpose of a status review is to assemble the best available information. **Appendix B** provides guidance on how to assess these factors, as well as several relevant modifying factors.

The biologist (or Team) will provide a description of methods for the risk analysis that was conducted, including evaluations of risk based on specific demographic factors (e.g., population abundance and trends, productivity, spatial structure, age structure, sex ratio, diversity, current and historical range, habitat integrity or fragmentation), any quantitative or qualitative estimates of overall extinction risk for the species, and the relative contribution of identified demographic risks to the overall assessed level of extinction risk. The demographic analysis is an assessment of the biological response or manifestation of past factors for decline and present threats.

If adequate data and time exist, the biologist (or Team) may also be able to model extinction risk at this stage. The probability of extinction risk should be estimated through the foreseeable future, and uncertainty parameters should be included in the estimates. For many species petitioned for listing under the ESA, available data are not sufficient for conducting a sound Population Viability Analysis (PVA) or other quantitative extinction risk assessment. No specific guidance is provided here for quantitative analysis because extinction risk models must be developed specifically for each species (though some software, such as RAMAS, exists that can be applied to different species when assumptions are satisfied). If sufficient data are available to conduct a quantitative analysis, then the biologist (or Team) should do so. When a PVA will be used as the principal, or sole, justification for a conclusion on extinction risk to a species, extra care should be given to clearly identify the inputs to the model. Assumptions on inputs such as carrying capacity may result in significant differences in the outputs of such models.

If the biologist (or Team) is unable to confidently assess the level of extinction risk, even qualitatively, he/she should document the data deficiencies and related uncertainties. The biologist (or Team) should then consult with the region and/or F/PR. In these situations, the region may decide to recommend to the AA that ESA listing is "not warranted" and the species could be designated as a Species of Concern, highlighting specific areas of needed research.

2) Description of Demographic Risks and Section 4(a)(1) Factors

Section 4(a)(1) of the ESA requires the agency to determine whether the species is endangered or threatened because of any of the following factors:

1) destruction or modification of habitat;
2) overutilization for commercial, recreational, scientific, or educational purposes;
3) disease or predation;
4) inadequacy of existing regulatory mechanisms; or
5) other natural or human factors.

The biologist (or Team) will organize and describe its assessment of threats according to these section 4(a)(1) factors. To the extent possible, the biologist (or Team) will describe the links between demographic risks and these causative section 4(a)(1)factors. Ideally, the biologist (or Team) will have sufficient information to assess extinction risk based on both demographic and threats-based information; however, the extent to which this is possible depends on the quantity

and quality of the available information. For example, in instances where the best available information pertains primarily to threats, the biologist (or Team) will describe the demographic risks that are expected to result from the particular threats, the likelihood of these demographic risks, and how these risks contribute to the overall risk of extinction. While the 4th factor, "inadequacy of existing regulatory mechanisms," is a different type of factor, the impacts on the species resulting from unregulated or inadequately regulated threats should be evaluated in the same way as the other four factors.

3) Identifying Significant Portions of a Species' Range

After estimating extinction risk of a species throughout the species' range and completing the threats assessment, the biologist (or Team) will also estimate the risk of extinction of the species and assess the threats to the species in any portions of its range that are determined to be significant. As noted above under Key Terms in the Definitions of "Endangered Species" and "Threatened Species," a portion of the range of a species will be considered "significant" if its contribution to the viability of the species is so important that, without that portion, the species would be in danger of extinction. The biologist (or Team) will analyze the best available scientific and commercial information and determine whether there are any portions within the range of the species with populations that contribute substantially to the viability of the species, or whether any areas are subject to a higher concentration of threats. If so, the biologist (or Team) will follow the guidance above (sections C.1 and C.2) to assess the extinction risk and threats to the population(s) in that portion of the range.

4) Structured decision making

Where a Team is convened to conduct the Status Review, we recommend that structured decision making (SDM) be used when it is necessary to make qualitative assessments of threat analysis. A SDM analysis should be based on clearly articulated fundamental objectives, deal explicitly with uncertainty, and respond transparently to legal mandates and public preferences or values in decision making. SDM is a general term for carefully organized analysis of problems in order to reach more transparent decisions that are focused clearly on achieving fundamental objectives. It encompasses a simple set of concepts and helpful steps, rather than a rigidly-prescribed approach for problem solving (USFWS, 2008). **Appendix C** provides a discussion on the use of SDM.

An SDM assessment approach that numerous NMFS Teams have used in previous status reviews (e.g., Pacific salmon, Southern Resident killer whale) to structure their thinking and express the associated level of uncertainty in assigning risk categories to a species is the ''likelihood point method," often referred to as the ''FEMAT method" because it is a variation of a method used by scientific teams evaluating management options under the Northwest Forest Plan (Forest Ecosystem Management and Assessment Team, 1993). In this approach, each Team member distributes 10 'likelihood points' among each option or 'bin,' allowing them to express a variety of types (e.g., normally distributed, one-tailed, bimodal, etc.) and ranges of uncertainty. This can be done for each individual factor evaluated to help the biologist (or Team) organize the analysis, followed by a distribution of likelihood points among different extinction risk categories. Given that there is a measure of uncertainty in estimating the risk of extinction, a series of four or more

probability categories or 'bins' for potential ranges of risks of extinction (or other query) should be used to adequately assess the uncertainty. Several examples illustrating the use of this likelihood point method are included in **Appendix C**.

Structured decision making can also be helpful in interpreting PVA results and evaluating threats. The likelihood point method described here is useful, but a biologist or Team can develop other methods of structuring their decision making or express uncertainty as appropriate.

D. Documenting Conclusions in a Status Review Report

When a Status Review Report is prepared the essential deliverable product is the review and analysis of the best available scientific and commercial information on the species. Staff from the region can assist by drafting sections of the report dealing with ESA statutory, policy, and other management considerations. The Status Review Report should provide a detailed documentation of the evaluation process used, explicitly describing uncertainties and where best professional judgment was applied.

The Status Review Report will also include a list of references used in completing it, including personal communications and "gray literature," as well as a list of primary individuals contacted. Personal communications that are included as references must be documented in a memorandum to the file or similar documentation and provided to the region and/or F/PR in order to be included in the docket. Gray literature included as references must be provided to the region and/or F/PR, along with a written explanation why the gray literature is reliable under the circumstances to be included in the decision file. In some circumstances, site-specific location information on species presence should be attached as a separate appendix so this information can be easily removed to protect listed plants or animals from being taken or collected.

The biologist (or Team) will not use the statutory terms "endangered" or "threatened" or their definitions when making conclusions regarding the species' risk of extinction, because the ultimate determination of a species' proposed status reflects consideration of the legal and policy dimensions of the ESA standards in addition to the best available science, as well as consideration of the benefits of ongoing conservation efforts that are assessed apart from the Status Review Report. In addition, a disclaimer will be included near the front of all Status Review Reports that states the following: "This document does not represent a decision by NMFS on whether this taxon should be proposed for listing as threatened or endangered under the Federal Endangered Species Act."

If a Status Review Report is prepared by a Team, minority opinions will be documented in the administrative record. Significant differences of opinion or apparent conflicts in available information will be documented in the text of the Status Review Report, as well as in the administrative record.

Pursuant to the Office of Management and Budget's (OMB) 2004 "Final Information Quality Bulletin for Peer Review" regarding implementation of peer review under the Information Quality Act (IQA), draft Status Review Reports must be peer reviewed. This peer review must be conducted prior to finalizing the Status Review Report. The OMB Bulletin is one aspect of a

larger OMB effort to improve the quality of the scientific information upon which policy decisions are based. Peer reviewers of the draft report should include the principal data contributors (including non-federal contributors) to ensure that their data have been correctly interpreted and analyzed. The NOAA guidelines and NMFS policy directive provide additional information on the requirements of this peer review process and should be consulted (http://home.nmfs.noaa.gov/pr/guidance/dqa/). Each region has an appointed IQA Coordinator; these coordinators may be consulted if there are questions regarding application of the OMB peer review Bulletin. Peer reviewers should clearly understand that they are reviewing a draft document that is not intended for further distribution. The biologist (or Team) subsequently revises the report to incorporate comments as appropriate.

References

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Wainwright, T.C. and R.G. Kope. 1999. Methods of extinction risk assessment developed for US West Coast salmon. ICES Journal of Marine Science 56:444-448.

Appendix A: *Definitions and Guidance on ESA Terms and Terminology*

Endangered – The ESA defines an endangered species as any species which is in danger of extinction throughout all or a significant portion of its range, other than a species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the provisions of this Act would present an overwhelming and overriding risk to man.

Factors for decline – The specific historical factors responsible for a species' decline. The statutory ESA section 4(a)(1)(A)-(E) factors encompass these historical factors. Factors for decline may or may not persist and limit the viability of the species. To the extent determinable, an ESA status review should articulate the links between demographic risks conferring the assessed level of extinction risk and causative historical factors for decline.

Foreseeable future – It is appropriate to interpret "foreseeable future" in the statutory context as the timeframe over which predictions about the future in making determinations about the future conservation status of the species can be reasonably relied upon (M-37021 2009 DOI memorandum). Those predictions can be in the form of extrapolation or population or threat trends, analysis of how threats will affect the status of the species, or assessment of future events that will have a significant new impact on the species. The identification of this time frame must be reasonable and based on the particular species' life history and threats and the reliability of models used to forecast threats over that "foreseeable future". This approach does not limit the time frame under consideration to the length of time into the future for which a species' status can be quantitatively modeled or predicted within predetermined limits of statistical confidence, but uncertainties of any modeling efforts should be documented. The appropriate period of time corresponding to the foreseeable future depends on the particular kinds of threats, the life-history characteristics, and the specific habitat requirements for the species under consideration. A single, defined "foreseeable future" or several "foreseeable futures" for different threats should be defined early on in the status review process, and the rationale for the definition of "foreseeable future" should be documented in the Status Review Report.

Readily available information - In developing a 90-day finding, we review the information presented and referenced in the petition in context of information that is readily available in our files. Staff reviewing the petition must not seek out additional information to answer questions not answered by information presented in the petition or do a "mini-status review". Several court rulings provide guidance on the bounds on what information can be considered in the agency's review of petitions. Information must be "available" at the time the petition is received and additional information should not be solicited from third parties. For example, in *Western Watershed Project v. Kempthorne* (D. Idaho Mar. 31, 2009), USFWS contacted the author (not a federal agency or a state) of one of the studies that the petitioner cited. The court held that it was permissible to clarify information related to a document cited, but that it was inappropriate to go beyond merely obtaining or clarifying the materials cited in the Petition by requesting additional information. See also "*substantial scientific or commercial information*."

Significant portion of its range (SPOIR) – NMFS and USFWS published a proposed interpretation of this phrase in the *Federal Register* on December 9, 2011. The Services will review and address public comments and finalize the interpretation. If the interpretation is finalized as proposed, a portion of the range of a species will be considered "significant" if its contribution to the viability of the species is so important that, without that portion, the species would be in danger of extinction. For now, agency staff involved in listing decisions should use this proposed policy, but include detailed rationale to support the analysis. There can be multiple potential SPOIRs for a given species.

Species of Concern (SOC) – A SOC is a species for which NMFS has some concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the ESA (69 FR 19975; April 15, 2004). The SOC list was established to highlight these potentially at-risk species and encourage research and conservation to prevent the need for ESA listing. Status as an SOC does not confer procedural or substantive ESA protections to a species.

Substantial scientific or commercial information – Several court rulings have addressed the term "substantial information." See *Center for Biological Diversity* v. *Morganweck*, 351 F. Supp. 2d 1137 D. Colo. Dec. 17, 2004; *Colorado River Cutthroat Trout* et al. v. *Kempthorne*, Civil Action No. 00-2497 (PLF); *Western Watersheds Project et al*. v. *Norton*, CV 06-00127-S-EJL, D. Idaho. Sep. 26, 2007; *Palouse Prairie Found. v. Salazar*, 2009 U.S. Dist. Lexis 10492 (E.D. Wash. Feb. 12, 2009). As noted on p. 2 of this guidance, substantial information is defined in our joint implementing regulations as the amount of information that would lead a reasonable person to believe that the measure proposed in the petition *may be* warranted (50 CFR 424.14(b)). Court rulings have held that: the ESA does not authorize weighing the information provided in the petition against information selectively solicited from third parties; the agencies cannot bypass the initial 90-day review and proceed to what is effectively a 12-month status review; proper evaluation of a petition is limited to whether it meets the "substantial information" threshold; the agencies cannot deny a petition for including information on only a limited area, unless they decide (with explanation) why that area is not a "significant portion of [the species'] range;" the agencies may not solicit (whether or not they actually receive any) outside information to assist in making the 90-day finding.

Threatened – The ESA defines a threatened species as any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Threats – Those human or natural events/actions that are responsible for, contribute to, or could contribute to the key limiting factors, inclusive of current and future threats. Future threats are activities that are likely to happen but are not currently occurring, or that may be existing threats that are likely to result in a mounting risk to the species. Examples of threats include human population growth that results in altered or degraded habitats, actions that degrade water quality, and mixed-stock harvest management strategies that result in incidental mortality of the subject species.

Appendix B: *General Conceptual Guidance for Evaluating Extinction Risk*

Questions to Consider in Evaluating a Species' Level of Extinction Risk

Threats to a species' long-term persistence are manifested demographically as risks to its abundance, population growth rate, spatial structure and connectivity, and genetic and ecological diversity. These demographic risks thus provide the most direct indices or proxies of extinction risk. A species at very low levels of abundance and with few populations will be less tolerant to environmental variation, catastrophic events, genetic processes, demographic stochasticity, ecological interactions, and other processes (e.g., Meffe and Carroll 1994, Caughley and Gunn 1996). A population growth rate that is unstable or declining over a long period of time indicates poor resiliency to future environmental change (e.g., Lande 1993, Middleton and Nisbet 1997, Foley 1997). A species that is not widely distributed across a variety of well-connected habitats is at increased risk of extinction due to environmental perturbations, including catastrophic events (Schlosser and Angermeier 1995, Hanski and Gilpin 1997, Tilman and Lehman 1997, Cooper and Mangel 1999). A species that has lost locally adapted genetic and ecological diversity may lack the raw resources necessary to exploit a wide array of environments and endure short- and long-term environmental changes (e.g., Groot and Margolis 1991, Wood 1995). Assessing extinction risk of a species involves evaluating whether risks to its abundance, population growth rate, spatial structure and or diversity are such that it is at or near an extinction threshold, or likely to become so in the foreseeable future.

The following considerations, adapted from McElhany et al. (2000), provide some general guidance for evaluating a species' extinction risk in terms of its population abundance and trends, productivity, spatial structure, age structure, sex ratio, diversity, current and historical range, and habitat integrity or fragmentation.

Questions for Evaluating a Species Extinction Risk

A. Abundance Questions

1.	**Is the species' abundance so low that it is at risk of extinction due to environmental variation or anthropogenic perturbations (of the patterns and magnitudes observed in the past and expected in the future)?** Environmental variation includes fluctuations in environmental and oceanographic conditions (such as oceanographic regime shifts and El Niño events), local disturbances (natural and anthropogenic), and environmental catastrophes. Anthropogenic perturbations include any human activity that directly or indirectly poses demographic risks to the species.
2.	**Is the species' abundance so low, or variability in abundance so high, that it is at risk of extinction due to depensatory processes?** Very low levels of species abundance and density may be insufficient to support mate choice, sex-ratios, fertilization and recruitment success, reproductive or courting behaviors, foraging success, and predator avoidance behaviors. A species exhibiting high variability in abundance and/or population growth rate may also experience strong depensatory risks at low points in its variability.
3.	**Is the species' abundance so low that its genetic diversity is at risk due to inbreeding depression, loss of genetic variants, or fixation of deleterious mutations?**
4.	**Is a species' abundance so low that it is at risk of extinction due to its inability to provide important ecological functions throughout its life-cycle?** Organisms may modify both their physical and biological environments in various ways throughout their life-cycle. Inability to affect these modifications can limit population production, and degrade habitat conditions for other organisms as a whole. The abundance levels required for these effects depend largely on the local habitat structure and particular species' biology.
5.	**Is a species' abundance so low that it is at risk due to demographic stochasticity?** Demographic stochasticity refers to the seemingly random effects of variation in individual survival or fecundity that are most easily observed in small populations. As species' abundance declines, the relative influences of environmental variation and demographic stochasticity change – with the latter coming to dominate.
6.	**Species status evaluations should take uncertainty regarding abundance into account.** Abundance estimates always contain observational error, and this should be taken into account with deference to the species. Additionally, short-lived species with wide inter-annual variations in abundance contribute to uncertainty about average abundance and trends. For these reasons, it would not be prudent to base an assessment of risk to a species' abundance on a single high or low observation. Depending on the circumstances, a species may be considered to be at risk if it satisfied the above conditions on average over a short period of time.

B. Population Growth Rate Questions

1.	**Is a species' average population growth rate below replacement and such that it is at risk of satisfying the abundance conditions described above?**

2.	**Is the species' average population growth rate below replacement and such that it is unable to exploit requisite habitats/niches/etc. or at risk due to depensatory processes during any life-history stage?** Very low levels of species population growth rate may be insufficient to support mate choice, sex-ratios, fertilization and recruitment success, reproductive or courting behaviors, foraging success, and predator avoidance behaviors.
4.	**Does the species exhibit trends or shifts in demographic or reproductive traits that portend declines in per capita growth rate which pose risk of satisfying any of the preceding conditions?** Changes in metrics, such as average size of mature individuals or average fecundity, that affect the instantaneous per capita growth rate are often more easily and precisely quantified than are changes in abundance, and may provide a more direct indication of declining growth rate.
5.	**Species status evaluations should take into account uncertainty in estimates of growth rate and population growth rate-related parameters.** To estimate long-term trends it is important to have an adequate time series. Unfortunately, such time series, when they exist at all, are often short, contain large observational errors, and/or exhibit gaps in observation. These constraints may greatly limit the power of statistical analyses to detect ecologically significant trends before substantial changes in abundance or distribution have occurred.

C. Spatial Structure Questions

1.	**Are habitat patches being destroyed faster than they are naturally created such that the species is at risk of extinction due to environmental and anthropogenic perturbations or catastrophic events?** With habitat being continually created and destroyed by natural processes, human activities should not severely reduce the area of distribution, or the number of habitat patches. Strong negative trends in the amount of available habitat deterministically increase extinction risk, although the relationship between decreasing the number/size of patches and extinction risk is not necessarily linear.
2.	**Are natural rates of dispersal among populations, metapopulations, or habitat patches so low that the species is at risk of extinction due to insufficient genetic exchange among populations, or an inability to find or exploit available resource patches?**
3.	**Is the species at risk of extinction due to the loss of critical source populations, subpopulations, or habitat patches?** Some populations, subpopulations, and habitat patches are naturally more productive than others. In fact, a few patches may operate as highly productive sources for several sinks that are not self-sustaining. Although potentially representing only a small fraction of the species' total distribution, declines in abundance or population growth rate of source populations may portend drastic declines for the species as a whole. However, it should be recognized that spatial processes are dynamic, and specific source and sink populations may exchange roles over time.
4.	**Analyses of species' spatial processes should take uncertainty into account.** Often, little information is available on how spatial processes relate to a species' extinction risk. As a default, it should be assumed that historical spatial processes and population structure were sustainable, but it is uncertain whether novel population structure will be.

D. Diversity Questions

The loss of diversity can reduce a species' reproductive fitness, fecundity, and survival, thereby contributing to declines in abundance and population growth rate and increasing extinction risk (e.g., Gilpin and Soulé 1986), *There is some uncertainty, however, whether the loss of diversity by itself confers an risk of extinction (see Brook et al. 2002). Although the loss of diversity certainly increases extinction risk through its compounding effects on other demographic factors, it is argued by some that the loss of diversity by itself plays a relatively minor role in extinctions. The loss of diversity can help bring species to a high risk status, but other demographic or environmental factors usually play the direct role in causing extinctions (Lande 1988, Caro and Laurenson 1994, Caughley 1994, Dobson 1999). In general, risks to a species' diversity are most pertinent to the consideration of whether it is likely to become an endangered species throughout all or a significant portion of its range (i.e., whether the species is threatened).*

1.	**Is the species at risk due to a substantial change or loss of variation in life-history traits, population demography, morphology, behavior, or genetic characteristics?** Many of these traits may be adaptations to local conditions, or they may help protect populations against environmental variability. A mixture of genetic and environmental factors usually causes phenotypic diversity, and the substantial loss of phenotypic diversity may indicate **elevated** risk even if current genetic techniques or data are unable to resolve a genetic basis.
2.	**Is the species at risk because natural processes of dispersal, migration, and/or gene flow among populations have been significantly altered?**
3.	**Is the species at risk because natural processes that cause ecological variation have been significantly altered?** Phenotypic diversity can be maintained by spatial and temporal variation in habitat characteristics. Processes that promote ecological diversity, including natural habitat disturbance regimes and factors that maintain habitat patches of sufficient quality, should not be significantly altered.
4.	**Species status evaluation should take uncertainty about requisite levels of diversity into account.** Our understanding of the role that diversity plays in species viability is limited. The historical representation of phenotypic diversity serves as a useful "default" guideline for evaluating species status.

E. Relevant Modifying Factors

The following are some relevant modifying factors that should be considered on a species-by-species basis in extinction risk evaluations, in the context of a species' unique life-history constraints (Mace et al., 2002). These factors may impact a species' resilience or vulnerability to particular threats, and will influence the magnitude and rate of declines in abundance and/or spatial distribution deemed critical for a species.

1.	**Life-History Characteristics** Low instantaneous per-capita rate of increase, r Slow growth Late maturation Long life-span Low fecundity Shifts in sex ratios with size and/or age Low effective population size Broadcast spawning and density thresholds for successful fertilization Low, infrequent recruitment

2.	**Population Characteristics** Low population density Limited dispersal Limited migration Strong depensatory or Allee effects
3.	**Habitat Constraints** Habitat specificity or site fidelity Low physiographic tolerance Habitat sensitivity Close species associations Strong ecological interactions (competition, parasitism, predation) Ontogenetic shifts in habitat Endemism, rarity, geographic extent
4.	**Specific Threats** Disease High rates of direct and/or indirect take Extreme commercial value

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Appendix C: *Structured Decision Making*

Use of structured decision making (SDM) methods will continue to be particularly important in data poor situations where use of expert opinion is essential. This appendix provides a brief overview of the purpose of SDM and an annotated bibliography for further guidance.

DeMaster *et* al. (2004) identified five cases in which the use of SDM in conducting a risk assessment is likely to be useful:

1) time is insufficient to complete more objective, quantitative techniques (e.g. as with petitions and 12-month findings);
2) data are limited and simple classification guidelines are not available or appropriate;
3) data are inadequate for quantitative assessment yet detailed, species-specific analysis is desired (e.g., projecting future threats);
4) data are substantial, but still inadequate to capture all relevant factors or their interactions for a risk analysis; and
5) quantitative analyses have been conducted, but need to be integrated into a structured decision making process.

Note that use of SDM is not necessarily limited to risk assessments; SDM may also be useful in structuring decisions made during the 'identifying species' and 'evaluating protective efforts' phase of a listing determination.

The purpose of decision structuring is to provide a rational, thorough, and transparent decision, the basis for which is clear to both the decision maker(s) and to other observers. Use of SDM methods allows for a rigorous decision-making process, the defensible use of expert opinion, and a well documented record of how a decision was made. SDM also accommodates limitations in human understanding and allows for problem solving in complex situations. SDM requires that uncertainty is dealt with explicitly and that biases are controlled for. The information used may be empirical data, or it may come from subjective rankings or expert opinion expressed in explicit terms. Even in cases where data are sufficient to allow a quantitative analysis, the structuring process is important to clearly link outcomes and decision standards, and thereby reveal the reasoning behind the decision.

A more in-depth overview of SDM and a discussion of several examples of the use of structured expert opinion are provided in Appendix 2 of DeMaster et al. (2004). Annotated references for further guidance on SDM are provided below. Here we provide two illustrations of the likelihood point method as used by Teams.

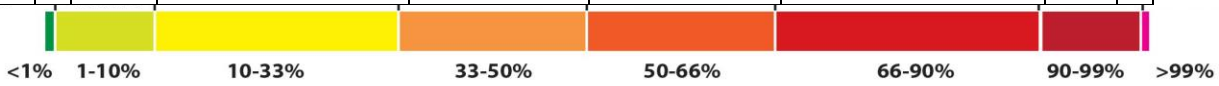
Example 1: Status review report of 82 candidate coral species under the ESA

Table 1 is adapted from the analysis used by the Corals Biological Review Team (BRT) in reviewing the status of 82 petitioned coral species (which was based on the Intergovernmental Panel on Climate Change methodology for summarizing conclusions about climate change research (Brainard *et al*., 2011)). Team members can use an iterative process to refine and narrow bin widths, particularly at the lower end of the continuum of probabilities of extinction where the differences may be more relevant, until they reach a limit based on available data, precision, and uncertainty. For example, if data, precision, and uncertainty allow for it, the 1-

10% bin could be divided into 1-5 and 5-10% bins, and the 10-33% bin into 10-15, 15-20, 20-25, 25-33% bins. The number of bins chosen in such an analysis will depend on the limits of the available data; however, we recommend avoiding use of exactly three bins because of the potential implication of equating them with Threatened, Endangered, and Not Warranted determinations. The Status Review Report is not the place to make recommendations on whether to list a species under the ESA; rather, the purpose is to assemble the best available information.

Table 1. Likelihood points assigned to different bins by Team members in estimating the likelihood that a species has a certain extinction risk over a certain period of time due to low abundance, low population growth rate, spatial fragmentations, or low diversity, etc.

Team member								
1		xx	xxx	xxxxx				
2			xxxxx	xxxxx				
3		xx	xxx	xxxxx				
4		x	xxxxx	xxxx				
5		xxx	xxxx	xxx				
6			xxx	xxxxxxx				
7		xxx	xxx	xxxx				



Example 2: Excerpt from Status review of five rockfish species in Puget Sound[4] (http://www.nmfs.noaa.gov/pr/pdfs/statusreviews/rockfish.pdf**)**

Risk Assessment Methods

One of the greatest difficulties in the status review process is organizing a large amount of information regarding the biology of the species, genetics, and population trends over time. Often the ability to measure or document risk factors is limited, and information is not quantitative and very often lacking altogether. In assessing risk, it is often important to include both qualitative and quantitative information. In previous NMFS status reviews, BRTs have used a risk matrix method (Table 4) to organize and summarize the professional judgment of a panel of knowledgeable scientists. This approach is described in detail by Wainright and Kope (1999) and has been used in Pacific salmonid status reviews (e.g., Good et al. 2005, Hard et al. 2007), as well as in reviews of Pacific hake, walleye pollock, Pacific cod (Gustafson et al. 2000), Puget Sound rockfishes (Stout et al. 2001a), Pacific herring (Stout et al. 2001b, Gustafson et al. 2006), and black abalone (*Haliotis chracherodi*) (VanBlaricom et al. 2009).

In the risk matrix approach, the collective condition of individual populations is summarized at the DPS level according to four demographic risk criteria: abundance, growth rate/productivity, spatial structure/connectivity, and diversity. These viability criteria, outlined in McElhany et al. (2000), reflect concepts that are well-founded in conservation biology and generally applicable to a wide variety of species. These criteria describe demographic risks that individually and collectively provide strong indicators of extinction risk. The summary of demographic risks and other pertinent information obtained by this approach is then considered by the BRT in determining the species' overall level of extinction risk.

Population viability analysis (PVA) is generally defined as the use of quantitative methods to predict the future status of a population. Future status typically refers to the probability of the population reaching some minimum size within some specified time horizon. Because of data limitations described below, the BRT did not conduct a formal quantitative PVA. However, as detailed in the following subsections, data were available that allowed an estimate in the trend in abundance of rockfishes and the BRT considered this information.

After reviewing all relevant biological information for the species, each BRT member assigned a risk score to each of the four demographic criteria. The scores were tallied (means, modes, and range of scores), reviewed, and the range of perspectives discussed by the BRT before making its overall risk determination. Although this process helps to integrate and summarize a large amount of diverse information, there is no simple way to translate the risk matrix scores directly into a determination of overall extinction risk. For example, a DPS with a single extant subpopulation might be at a high level of extinction risk because of high risk to spatial structure and connectivity, even if it exhibited low risk for other demographic criteria. Another species might be at risk of extinction because of moderate risks to several demographic criteria.

[4] This is a good example of how a risk matrix approach (evaluating the 4 VSP criteria) can be used to come up with an overall risk determination (using the likelihood point method). This method has been used often, but in this guidance we recommend against using exactly 3 bins or categories as was done here for the overall risk determination.

Scoring Population Viability Criteria

Risks for each demographic criterion are ranked on a scale of 1 (very low risk) to 5 (very high risk):

1. Very low risk: It is unlikely that this factor contributes significantly to risk of extinction, either by itself or in combination with other factors.
2. Low risk: It is unlikely that this factor contributes significantly to risk of extinction by itself, but some concern that it may, in combination with other factors.
3. Moderate risk: This factor contributes significantly to long-term risk of extinction, but does not in itself constitute a danger of extinction in the near future.
4. High risk: This factor contributes significantly to long-term risk of extinction and is likely to contribute to short-term risk of extinction in the foreseeable future.
5. Very high risk: This factor by itself indicates danger of extinction in the near future.

Recent Events

The "recent events" category considers events that have predictable consequences for DPS status in the foreseeable future but have occurred too recently to be reflected in the demographic data. Examples include a climatic regime shift or El Niño that may be anticipated to result in increased or decreased predation in subsequent years. This category is scored as follows:

+ + expect a strong improvement in status of the DPS
+ expect some improvement in status
0 neutral effect on status
– expect some decline in status
– – expect strong decline in status

Table 4. Template for the risk matrix used in BRT deliberations. The matrix is divided into five sections that correspond to the four VSP parameters (McElhany et al. 2000) plus a recent events category.

Risk Category	**Score**
Abundance Comments:	
Growth rate/productivity Comments:	
Spatial structure and connectivity Comments:	
Diversity Comments:	
Recent events	

Overall Risk Determination

As noted in Footnote 6, this status review was conducted before the current guidance to avoid the use of exactly 3 categories of risk; this example would be more appropriate for this guidance if there had been an additional category or two. Still, it helps to illustrate how these types of risk determinations can be conducted.

The BRT's analysis of overall risk to the species or DPS used the categories of "high risk" of extinction, "moderate risk" of extinction, or "not at risk" of extinction. The table below describes the qualitative reference levels of extinction risk associated with these terms. The overall extinction risk determination reflected informed professional judgment by each BRT member. This assessment was guided by the results of the risk matrix analysis, integrating information about demographic risks with expectations about likely interactions with threats and other factors.

To allow individuals to express uncertainty in determining the overall level of extinction risk facing the species, the BRT adopted the "likelihood point" (FEMAT) method. See Table 27 for an example worksheet. This method has been used in all status review updates for anadromous Pacific salmonids since 1999, as well as in reviews of Puget Sound rockfishes (Stout et al. 2001a), Pacific herring (Stout et al. 2001b, Gustafson et al. 2006), Pacific hake, walleye pollock, Pacific cod (Gustafson et al. 2000), and black abalone (VanBlaricom et al. 2009).

	Description of reference levels for the BRT's assessment of extinction risk.	
	Qualitative "reference levels" of relative extinction risk	
Continuum of decreasing relative risk of extinction	Moderate risk: A species or DPS is at moderate risk of extinction if it exhibits a trajectory indicating that it is more likely than not to be at a high level of extinction risk (see description of "High risk" below). A species or DPS may be at moderate risk of extinction due to projected threats or declining trends in abundance, productivity, spatial structure, or diversity. The appropriate time horizon for evaluating whether a species or DPS is more likely than not to be at high risk depends on various case- and species-specific factors. For example, the time horizon may reflect certain life history characteristics (e.g., long generation time or late age-at-maturity) and may also reflect the time frame or rate over which identified threats are likely to impact the biological status of the species or DPS (e.g., the rate of disease spread). The appropriate time horizon is not limited to the period that status can be quantitatively modeled or predicted within predetermined limits of statistical confidence. Please explain the time scale over which the BRT has confidence in evaluating moderate risk.	
	High risk: A species or DPS with a high risk of extinction is at or near a level of abundance, productivity, spatial structure, and/or diversity that place its persistence in question. The demographics of a species or DPS at such a high level of risk may be highly uncertain and strongly influenced by stochastic or depensatory processes. Similarly, a species or DPS may be at high risk of extinction if it faces clear and present threats (e.g., confinement to a small geographic area; imminent destruction, modification, or curtailment of its habitat; or disease epidemic) that are likely to create such imminent demographic risks.	
Extinct		A species or DPS is extinct when there is no longer a living representative.

General References

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Good general textbook loaded with examples. Comes with student version of popular decision analysis software.

Drake J.S., E.A. Berntson, J.M. Cope, R.G. Gustafson, E.E. Holmes, P.S. Levin, N. Tolimieri, R.S. Waples, S.M. Sogard, and G.D. Williams. 2010. Status review of five rockfish species in Puget Sound, Washington: bocaccio (*Sebastes paucispinis*), canary rockfish (*S. pinniger*), yelloweye rockfish (*S. ruberrimus*), greenstriped rockfish (*S. elongatus*), and redstripe rockfish (*S. proriger*). U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-108, 234 p.

Goodwin, P. and G. Wright. 1999. Decision Analysis for Management Judgment. 2nd Ed. Wiley and Sons, NY.
Very accessible introductory book covers all the decision analysis topics. 2nd Edition includes especially strong chapters on human judgment. If you only read one reference, pick this one.

National Research Council. 1995. Making ESA Decisions in the Face of Uncertainty. Pp. 157-178 *in* Science and the Endangered Species Act. National Academy Press, Wash., DC.
Great summary of the basic ideas about structuring decisions in an ESA context.

Risk Analysis and Decision Making Under Uncertainty

Akcakaya, H.R., et al. 2000. Making consistent IUCN classifications under uncertainty. Conservation Biology 14(4):1001-1013.
Describes how to use intervals ('fuzzy numbers') in place of point estimates when species information is uncertain, to assure that decisions take full account of uncertainties.

Anderson, J.L. 1998. Embracing uncertainty. Conservation Ecology 2:2. Online at: http://www.consecol.org/vol2/iss1/art2 .
Presents tactics for using Bayesian methods, so uncertainty can be better treated in decision making. Good discussion of human cognition of uncertainty and probability.

Burgman, M.A., S. Ferson and H.R. Akçakaya. 1993. Risk Assessment in Conservation Biology. Chapman Hall, New York. 314 pp.Thorough description of risk assessment simulation modeling for conservation biology contexts (e.g., population viability analysis). See Morris and Doak for more current treatment.

Maguire, L.A. 1991. Risk analysis for conservation biologists. Conservation Biology 5(1):123-125.
A call for using the risk analysis framework for decisions about environmental impacts, with discussion of traditional and alternative burden of proof standards.

Morris, W.F. and D.F. Doak. 2003. Quantitative Conservation Biology: Theory and Practice of Population Viability Analysis. Sinauer Associates, Inc. 480pp.

Covers multiple approaches to population viability analysis, including 'count-based PVA' (extrapolation of trends from survey data), demographic simulation, and habitat occupancy (e.g., presence-absence modeling) approaches. Excellent, more technical reference.

Modeling

Beres, D.L., C.W. Clark, G.L. Swartzman and A.M. Starfield. 2001. Research notes: truth in modeling. Natural Resource Modeling 14(3):457-463.
A very short and to-the-point article on what modelers should always describe when reporting modeling projects.

Oreskes, N., K. Shrader-Frechette and K. Belitz. 1994. Verification, validation and confirmation of numerical models in the earth sciences. Science 263:641-646.
Discussion of often misused terminology, and what you really need to know about simulation model evaluation and reliability in the biological as well as earth sciences.

Peck, S.L. 2000. A tutorial for understanding ecological modeling papers for the nonmodeler. American Entomologist 46(1):40-49 [condensed in 2001 *in* Conservation Biology in Practice 2(4):36-40].
A quick summary of modeling concepts, with a nice glossary. Covers spatial and demographic modeling.

Starfield, A.M. 1997. A pragmatic approach to modeling for wildlife management. Journal of Wildlife Management 61:166-174.
Easily read summary of very practical ideas about how to model, and how to look at others' models.

Starfield, A.M. and A.L. Bleloch. 1991. Building Models for Conservation and Wildlife Management. Burgess International Group, Inc., Edina, MN. 253pp.
How-to book on creating useful models. Helps you decide what kind of model fits your problem, from deterministic and unstructured to stochastic, spatially-structured and individual-based models.

Expert Opinion and Group Facilitation

Ayyub, B.M. 2001. Elicitation of Expert Opinions for Uncertainty and Risks. CRC Press, Boca Raton, FL. 302pp.
The best, though technical, textbook on how to elicit and use expert opinion for risk analysis.

Andelman, S.J. et al. 2001. Scientific standards for conducting viability assessments under the National Forest Management Act: report and recommendations of the NCEAS working group. Chapter 8: Expert Opinion. National Center for Ecological Analysis and Synthesis, Santa Barbara, CA. see: http://www.nceas.ucsb.edu/ Open "Research Projects" tab on the left sidebar; search for: "Review of Forest Service Viability Assessment Processes;" when it opens click on NCEAS viability final report 1201 in PDF format
Concise guidance on using experts and facilitating expert groups to aid decisions about species conservation.

Coughlan, B.A.K. and C.L. Armour. 1992. Group decision-making techniques for natural resource management applications. U.S. Fish and Wildlife Service Resource Publication

185. D.C. Overview of techniques used to aid group decision making, focusing on group behaviors and processes more than the details of decision analysis methods.

Marcot, B.G. 1997. Use of expert panels in the terrestrial ecology assessment, Interior Columbia Basin ecosystem management project. Extract from Marcot, B.G., M.A. Castellano, J.A. Christy, L.K. Croft, J.F. Lehmkuhl, R.H. Naney, R.E. Rosentreter, R.E. Sandquist, and E. Zieroth. 1997. Terrestrial ecology assessment. Pp. 1497-1713 in: T.M. Quigley and S.J. Arbelbide, ed. An assessment of ecosystem components in the interior Columbia Basin and portions of the Klamath and Great Basins. Volume III. USDA Forest Service General Technical Report PNW-GTR-405. USDA Forest Service Pacific Northwest Research Station, Portland, OR. 1713 pp. Available online at: http://www.spiritone.com/~brucem/icbexexp.htm
Succinct summary of how expert panels were used; easily accessed online.

Shaw, C.G. III. 1999. Use of risk assessment panels during revision of the Tongass Land and Resource Management Plan. General Technical Report PNW-GTR-460. USDA Forest Service, Pacific Northwest Research Station, Portland, OR.
Describes the protocol developed by the US Forest Service to conduct multiple species viability assessments using expert panels and the 'modified Delphi' approach (adapted from the NW Forest Plan effort (FEMAT 1993)).

Some Web Resources for Structured Decision Making
(NOAA does not necessarily endorse any of the products referenced.)

Decision Analysis Society (especially see the "Field of Decision Analysis" link)
http://faculty.fuqua.duke.edu/daweb/
International Society on Multiple Criteria Decision Making http://www.terry.uga.edu/mcdm/
Society for Risk Analysis
http://www.sra.org/
RAMAS Red List (IUCN species risk classification) http://www.ramas.com/redlist.htm
NatureServe sites describing Heritage species ranking methodology
http://www.natureserve.org/prodServices/heritagemethodology.jsp
http://www.natureserve.org/explorer/ranking.htm

Appendix D: ***Template for a Terms of Reference Document***

[Species name(s)]
Status Review Team (SRT)
Terms of Reference
[date]

1. INTRODUCTION AND BACKGROUND

On [date], the National Marine Fisheries Service (NMFS) received a petition from the [petitioner] requesting that [action(s) requested]. On [date], NMFS determined that the petition presented substantial information indicating that the petitioned action may be warranted for [species name(s)] (a "positive 90-day finding") and published the finding in the *Federal Register* ([citation, date]), pursuant to 50 CFR 424.14

The [regional RA(s) or F/PR Director] decided to establish a Status Review Team (SRT) to compile the best available scientific and commercial information on the species, evaluate the demographic risk to the species, analyze the five factors listed under section 4(a)(1) of the ESA as they pertain to this risk, and estimate extinction risk of the species.
The best available scientific and commercial information includes, but is not limited to, published and unpublished literature, reports, models, and other data, coupled with numerous personal communications for obtaining updated information. New field surveys and other forms of research are NOT required, though may be included if results are available during the time that the review is being conducted.

2. ROLES AND RESPONSIBILITIES

Within the constraints of appropriations, NMFS will provide funds as needed for travel expenses for SRT travel and meetings; however, NMFS will not pay salaries or honoraria to members or advisors. NMFS will provide administrative support, such as photocopying, procurement of supplies, and expenses related to printing and distributing materials. In addition, NMFS may contract for services to the BRT or to outside experts for specific products or to facilitate the meetings and deliberations relating to the drafting and assembling of the Status Review report or other documents for the team's use.

2.1 Structure

2.1.1 NMFS Liaison(s)

The NMFS liaison is/are [name(s) and affiliation(s)], and the liaison's responsibilities are: (1) serve as a conduit for communication within NMFS and between NMFS and other NOAA offices as appropriate; (2) assist in coordination of meetings; (3) provide advice concerning the ESA listing process, and (4) serve as Custodians of the Decision File for the record.

2.1.2 Status Review Team

The Chair for the [species name(s)] SRT is [name], [affiliation], who was designated as Chair by [name/affiliation]. The SRT Chair will (1) chair the SRT; (2) organize, schedule, and facilitate team meetings; (3) coordinate the various writing and other assignments for drafting the Status Review report; and (4) keep the SRT moving forward on an agreed upon timeline and make sure steady progress is made.

The members of the [species name(s)] SRT are: [name (affiliation), name (affiliation), etc.].

The SRT may also call on other Federal and non-Federal subject matter experts to provide expert information to the SRT on an individual basis. However, these experts will not be involved in any deliberations of the SRT.

All meetings and documents produced by the SRT are confidential until the final status review report is published. All participants in this effort, including those acting in an advisory capacity to the SRT, are required to comply with these measures.

2.1.3 Function & Charge

This SRT was established to assess the status of the [species name(s)] identified in the positive 90-day finding. The SRT must review and synthesize the best available scientific and commercial information, render expert opinion, and prepare a written report (see 3. Status Review Report Content). The objective for the SRT is to draft a Status Review report that provides thorough science-based analyses regarding the demographic risks to the species, the five section 4(a)(1) factors under the ESA as they pertain to the species, and extinction risk to the [species name(s)], with consideration of applicable policies and statutory terms. The charges to the SRT are listed below. For more details on any of the following aspects of a Status Review Report, see Listing Guidance (link).

a) The SRT will determine whether a conservation benefit might result if the species under review were divided into Distinct Population Segments (DPSs) by considering the following factors:[5]

   1) Are some populations of a species or subspecies more at risk, or not at risk?
   2) Can we better preserve genetic integrity by listing as DPSs?
   3) Would ESA protections be expedited by focusing on one or more DPSs instead of the entire species' range?
   4) Will processing multiple actions associated with multiple DPSs take away from protection of this or other species?
   5) If dividing an already-listed species with critical habitat in place into DPSs, can statutory requirements to designate critical habitat for each new DPS be met on a timely basis so that the species is not left without a critical habitat designation

[5] If a petition requests that we list a particular population as threatened or endangered, NMFS has no discretion, and the SRT will apply the DPS Policy criteria to determine whether the population(s) qualify as a DPS(s).

(i.e., can a new critical habitat designation be published simultaneously with the new DPS listing(s)?[6]

6) Will mixing of individuals among DPSs make it difficult to quantify and monitor take if we list separate DPSs instead of one taxonomic species or subspecies?
7) Will the need to redo any section 4(d) regulations for newly listed DPSs of a species previously listed rangewide result in lapses in protections (i.e., can a new section 4(d) regulation be published simultaneously with the new DPS listing(s)?
8) Would recovery be expedited by focusing on DPSs instead of entire species' range or vice versa?
9) Would delisting a DPS of a listed species negatively impact the recovery of the rest of the species (presumably made up of several additional DPSs)?

b) If the SRT determines that a conservation benefit might result if the species were divided into DPSs, it will apply the DPS Policy criteria (scientific and policy considerations) to determine whether any populations of the species satisfy the DPS Policy criteria. If so, the SRT will conduct the analyses in steps c) through e) for the taxonomic species or subspecies, as well as for each such population.

c) The SRT will evaluate the demographic risks to the species (abundance, spatial distribution, productivity, diversity).

d) The SRT will analyze the Section 4(a)(1) factors of the ESA identified below, as they relate to the demographic risks to the species:

- Present or threatened destruction, modification, or curtailment of the species' habitat or range;
- Overuse for commercial, recreational, scientific, or educational purposes;
- Disease or predation;
- Inadequacy of regulatory mechanisms; and
- Other natural or manmade factors affecting its continued existence.

The SRT, to the extent possible, is asked to describe the links between demographic risks and these causative factors. The SRT will need to adapt its analysis according to the quantity and quality of the best available information.

e) Finally, the SRT will estimate the risk of extinction of the species, quantitatively (e.g., x probability of extinction in y years) or qualitatively (e.g., very low, low, medium, high, or very high risk of extinction). For a qualitative analysis, the SRT will not use exactly three categories.

[6] General Counsel guidance states that we are required to designate critical habitat for newly listed DPSs even if the taxonomic species is already listed and has critical habitat designated.

The Status Review Report may also provide information related to consideration of critical habitat for [species name(s)], but the determination of critical habitat is not required as part of the Status Review Report.

The evaluations and analyses of any species being considered for listing under the ESA must be based solely on the best scientific and commercial data available, and after considering ongoing conservation efforts. Therefore, this Status Review Report will not make reference to the possible economic or other impacts of any future listing, and the SRT will not evaluate such impacts.

The SRT is NOT charged with making listing recommendations, and the Status Review Report should underscore that the conclusions do not represent conclusions regarding the species' listing status under the ESA. Proposed listing recommendations are the responsibility of [region(s) or F/PR]. However, [region(s) or F/PR] will rely on the Status Review Report, any other information it may obtain, ongoing conservation efforts, and its expertise with ESA regulations and policies, when making any listing recommendations.

Conclusions for the Status Review report will be based on a variety of voting mechanisms. These voting mechanisms include, but are not limited to, consensus, agreement of a simple majority, defined as [x out of y] agreement within the SRT, allocation of certainty points among options, or qualitative assignment of [e.g., very high, high, medium, low, or very low risk]. Voting may be confidential within the group to prevent pressure amongst peers. Voting on a particular topic may occur more than once with intervening discussion of the previous vote. Members may abstain from voting if they do not feel they have the information or expertise necessary to form an independent opinion, though abstention is not encouraged. If votes occur during the absence or one or more SRT members, those votes will stand if the vote of the missing member would not have changed the outcome of the vote. A delay of voting or re-voting upon the SRT member's return may occur at the SRT's discretion. Minority opinions will be documented in the administrative record. Significant differences of opinion or apparent conflicts in available information will be documented in the text of the Status Review report, as well as in the administrative record. Minority reports will be authored by the dissenting members and will be included in the Status Review Report. The decision-making process for each element voted upon also will be documented in the Status Review report and in the administrative record. All elements of the Status Review report will remain confidential until the report is published on the [website] for public review.

SRT participation may include meetings, video, web, or teleconferences, email exchange, analyses, writing and review of documents.

3. STATUS REVIEW REPORT CONTENT

Generally, the Status Review Report should include:

- Introduction/Background – Description of purpose and need for the review; description of approach to the review analysis

- Update on species' taxonomy, biology and ecology – Discussion of any new information that is relevant to species status
- Consideration of factors to determine whether a conservation benefit might exist if the species is divided into DPSs
- Evaluation of demographic risks (abundance, spatial distribution, productivity, diversity) to the species or subspecies, and any identified DPSs
- Assessment of the five ESA section 4(a)(1) factors and how they contribute to extinction risk
- Assessment of extinction risk – quantitative or qualitative
- Conclusions
- References and Appendices

Existing NMFS Status Review reports, such as the [examples of reports] will be used as guidelines for the structure of the Status Review Report.

Attachments:

Positive 90-day finding published in *Federal Register*.